Modification to Synthetic Free Electron-Based Light-Reflective Energy Curtain Concept for Photon Accumulators (ibid. 24 October 2023) Enables Novel Synthetic Parabolic Optical Mirror for Orbital Imaging Platforms for Virtual Mirror Widths in Excess of 200 Meters

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Introduction

The ability to emit free electrons in specific configurations emulative of the electron clouds of known reflective materials brings with it the ability to create synthetic mirrors as described in the publication of 24 October 2023.

While many improvements to sensor performance have been conceptualized within the past few years and while the level of resolution enabled by certain novel techniques broadly categorized under the Resolution as a Function of Exposure Time (RFET) paradigm may be considered to be sufficient or even excessive for most applications, demand certainly exists for levels of overall performance in excess of the current SOTA. These performance improvements may be broadly divided between those improvements made to sensors and those made to mirrors.

While lightweight mirror materials certainly exist that may be lifted into orbit with relative ease, increasing the diameter of imaging platforms increases the risk of damage resulting from collisions with space junk, meteorites, or from G-forces resulting from the use of thrusters to change the orbital trajectory of such hypothetical mirrors either for hazard-avoidance or re-targeting. The ability to collect light from a wider area without the aforementioned disadvantages would significantly push forward the SOTA.

Abstract

While perfectly flat intermittently-present walls of structured free-electrons are useful for facilitating the conditionally permissive flow of photons into photon accumulators where the application is increasing the intensity of pulsed LASER devices, in the case of imaging applications, these walls of energy can revolutionize orbital imaging efforts provided that the synthetic mirrors can be made to curve.

A space telescope may be outfitted with a precision free-electron LASER emission mechanism housed within a bevel around the primary housing of the telescope. Millions of hyper-collimated electron clusters emulative of known reflective materials would be emitted from the platform at an obtuse angle with respect to targeted imaging area.

These electrons could be made to follow a curved path over a distance of several hundred meters via the effects caused by a secondary support platform situated several miles behind the space telescope which directs soliton waves toward the telescope which, naturally, travel in the direction in which the telescope is pointed.

This support platform would, much like a soliton emission platform used for submarine detection and ground-penetrating imaging, emit flat walls electromagnetic energy in a particular direction. As solitons can exert magnetic force unidirectionally (a feat of which individual electrons and physical magnets are incapable due to their possession of dipoles,) if solitons were emitted over a wide area, free electrons emitted outward from the imaging platform (roughly transverse to the direction of travel of the solitons) would be caused to follow a curved overall path by the soliton waves and the extent of the alteration to their trajectory would increase relative to the number of successive soliton waves they interact with, suggesting that the solitons ought to be pulsed with extreme rapidity in such a mechanism for maximal effect.

The maximum effective range of virtual parabolic mirror would be limited only by one's ability to maintain the emulative relative spacings of the free electrons and the width and strength of the soliton waves.

Conclusion

The aforementioned concept would, if developed, bring about a minimum of a 20-fold improvement in effective resolution with a moderate increase to overall cost. This approach would be particularly consequential for HEO Continual Surveillance application in which wider mirrors would be needed to match the effective performance of LEO platforms.